CASE STUDY REPORT #75
LAKE TAHOE DAM
TRUCKEE RIVER

I. Project Description

The original Tahoe Dam was constructed on the Truckee River near Tahoe City, California, sometime in the 1870's. Historical records did not give a description of the original dam or the reason for its construction. During the era, timber harvesting and mining were the major industries in the basin. A large lumber mill was located adjacent to the Truckee River near the City of Truckee. It is believed that the Tahoe Dam was constructed to regulate the flows of the Truckee River to flush logs down to the lumber mill at Truckee. With the start of the Newlands project in 1909 in Nevada, the Bureau of Reclamation took over operation and maintenance of the dam.

II. Pre-Project Conditions

Lake Tahoe is one of the largest natural lakes in America. Its maximum length from north to south is 21.5 miles and its extreme width from east to west is 12 miles. The lake covers an area of 193 square miles and its altitude above sea level is 6,225 feet at mean low stage. Its greatest recorded depth is 1,645 feet. The tributary watershed including its own surface area is 519 square miles.

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The boundary line between the State of California and Nevada passes through the lake leaving about two thirds of its area in California and one third in Nevada. The entire watershed is composed of rugged precipitous mountains, which rise from 1,500 to 4,700 feet above the lake surface and generally descend abruptly to the water's edge.

Lake Tahoe's natural outlet is the Truckee River which leaves the lake near Tahoe City, California (Figure 1). The dam is used to regulate the elevation of the lake between limits specified in a bistate compact.

The Truckee River flows 37 miles to the Nevada boundary. This section of the Truckee River and its tributaries supported an outstanding trout fishery. A reduction of food supplies and suitable areas for spawning have depleted the stock of naturally spawning trout. To alleviate the problems created by the reduction of spawning habitat, one of the earliest trout hatcheries in California was constructed on the Truckee River. The California Commission of Fisheries reported in 1870-1871 "on the Truckee River about 5 miles above the Town of Truckee, the Brothers Comer have an establishement for the artificial hatching of trout. They have been engaged in this business for the past three years and have successfully hatched and have in their ponds more than half a million fish" (Fisheries Commission, 1871). Although most of these fish were sold to local markets, excess fish were released to the Truckee River.

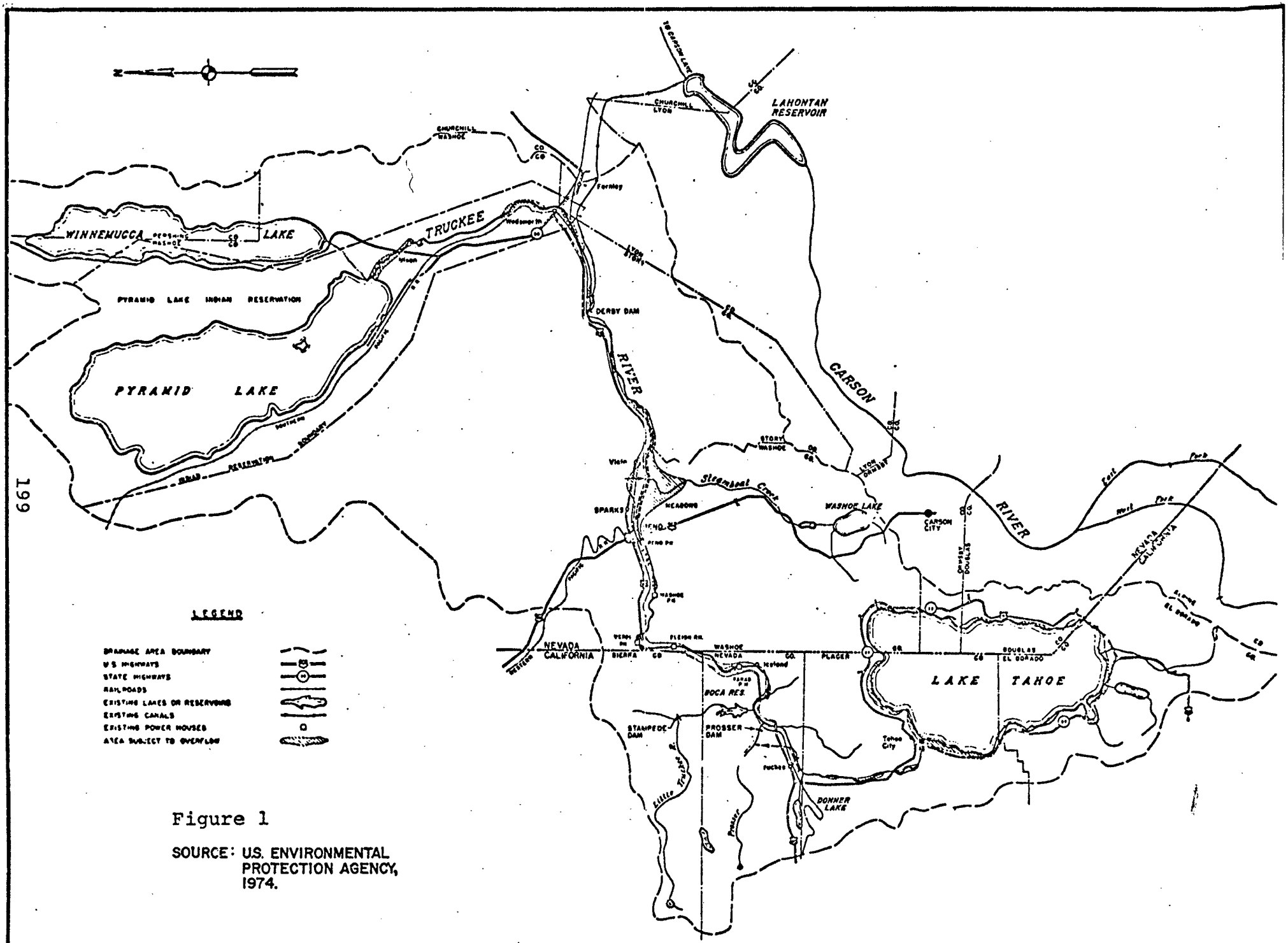

Figure 1

SOURCE: U.S. ENVIRONMENTAL PROTECTION AGENCY, 1974.

A description of the Truckee River fishery prior to the construction of Tahoe Dam was not recorded. Examination of readily available historical records did not reveal a description of the fishery prior to the 1920's. The 1920's descriptions are extremely limited and were centered on the Lake Tahoe fishery.

Lahontan cutthroat trout is the only trout species native to the Tahoe region. Historically, tourists were attracted to the Truckee-Tahoe basin in the spring to catch these fish in their annual spawning migration. Changes in the natural environment, competition from other species of fish, and hybridization with rainbow trout have caused the depletion of the cutthroat trout population to a comparatively remnant level. Incremental alterations of the natural environment of the Truckee-Tahoe basin have taken place as a secondary effect of human activity since the early pioneers began settling this region in the mid 1800's.

Records of instream flows prior to the construction of Tahoe Dam were not available and may not have been recorded. The earliest recorded instream flows were compiled in 1901 by the U. S. Geological Survey and published in the Water Supply and Irrigation Papers of 1901.

III. Project Development

The original Tahoe Dam was built sometime in the 1870's by a private individual. The Tahoe Dam has changed ownership and been modified several times from the 1870's to the early 1900's. In 1902, the U. S. Geological Survey in their Water Supply Paper No. 68 (1902) described the Lake Tahoe Dam. Their description is as follows:

> "In the channel of Truckee River, about 500 feet back from the lake, is a crib dam of timber and stone, which for the last twenty years or more has been controlled by the Truckee Lumber Company, which has used the lake waters for flushing logs down the river and for supplying power to its sawmills at Truckee when the natural flow of the stream is insufficient for those purposes. For the last five years the waters have not been employed for flushing logs, but they are still used for power purposes. The dam has three openings, with 10.7, 10.5, and 9.3 feet clear width, which are closed by timber gates. The two wider openings have in the center vertical posts 8 inches in width, which have been deducted in the widths of the openings given. The dam has a waste way of 72 feet clear length and 6 feet above the floor of the gates." (U. S. Geological Survey, 1902)

In 1908 the Truckee River General Electric Company, predecessor to the Sierra Pacific Power Company purchased all the power plants along the Truckee River, as well as the flow regulating Lake Tahoe Dam. The terms of the purchase included an agreement by the power company to maintain an average flow at Floriston, near the California-Nevada border, of 500 cfs between March 1 and September 30 and 400 cfs during the remaining months of the year. These release requirements became

known as the "Floriston Rates". At the time, they were designed to assure sufficient water for power generation in California and for municipal and irrigational uses in Nevada. Reno diverts its municipal water supply directly from the river. Also in 1908:

> "The Bureau of Reclamation initiated the Newlands project, to supply irrigation water to a large area of land near Fallon, Nevada. In 1909 the bureau was granted control of the Lake Tahoe Dam and gates by the Truckee River General Electric Company. The power company was granted extensive rights to uses of the Truckee in return.
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> "Litigation led to the Federal Court Decree of 1915, granting ownership of Lake Tahoe's storage and water facilities to the U. S. Government. The Order stipulated that the natural rim of the lake elevation be kept at 6,223 feet and that the U. S. Government operate the Lake Tahoe water facilities and maintain the Floriston rates in order to meet power and irrigation requirements.
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> "Other agreements and court orders settled many of the other issues surrounding water usage in the Tahoe-Truckee basin. In a 1935 Truckee River Agreement, the Floriston rates were reaffirmed, except that they did not have to be maintained during those periods of low lake levels occurring between November 1 and March 31. During this time, the new rates were established at 350 cfs for lake levels between 6,225.25 and 6,225.0 feet, and 300 cfs for lake levels below 6,225.25 feet. The low level elevation of the lake was fixed at 6,223.0 feet above sea level, and the high water level was fixed at 6,229.1 feet above sea level. The agreement in 1935 also authorized the construction of Boca Reservoir, which has a storage capacity of 40,000 acre-feet on the Little Truckee River."

The Nevada and California Fish and Game Commissions in January 1953 issued a joint statement regarding the development of the Truckee and Carson River as proposed by the

Bureau of Reclamation's Washoe project. The Washoe project includes storage features in the Truckee and Carson River basins for irrigation, power and flood protection. The joint commission studied the plans and evaluated the manner with which each facet of the project would affect fish and wildlife in the region. By adding other reservoirs to the system to supply water to the Floriston rate, the reach of river immediately below Lake Tahoe could have been nearly dry at times. The following recommendations were issued to the U. S. Bureau of Reclamation in January 1953:

Flow Requirements

"1. Lake Tahoe Dam Flow Releases:

a. In years of normal predicted runoff a minimum release of 70 cfs shall be maintained at all times.

b. In years of sub-normal runoff the minimum releases can be reduced on a percentage basis equal to the percentage the predicted runoff is below normal.

c. In years of above-normal runoff the minimum releases will be increased in direct proportion to the percent the predicted runoff is above normal, unless such increased flows would result in flows at Iceland in excess of the Floriston rates. At such times, the Tahoe releases can be reduced to or maintained at the 70 cfs minimum. When the flows at Iceland decline to a point where they do not exceed the Floriston rates, then the increased release schedule shall be resumed.

d. The above flow requirements shall be put into effect forthwith.

e. The normal and predicted runoff as referred to above are to be determined from the April forecasts based on official annual snow surveys of the Tahoe drainage basin. These forecasts are presently published in the 'Federal-State Cooperative Snow Survey and Irrigation Water Forecasts' by the Division of Irrigation of the U. S. Soil Conservation Service through the Agricultural Experiment Station, University of Nevada." (Nevada-California Fish and Game Commission, January 1953)

In March 1954 the U. S. Fish and Wildlife Service issued a Detailed Report on Fish and Wildlife Resources in Relation to the Water Development Plan for the Washoe Project Truckee and Carson Rivers, California and Nevada. This analysis of the Washoe project indicated that in the case of releases to streamflow from the Lake Tahoe outlet a simple statement of a desirable rate is impractical.

> "It is essential for proper fishery management to have a uniform release from the lake of as great a magnitude as the water supply and the permissible fluctuation of Lake Tahoe will permit. To accomplish this purpose, release criteria must be related to a workable formula for predicting runoff of the lake. It is believed that a release of 50 second-feet when practicable as proposed by the Bureau with the project does not provide the best obtainable conditions. The California Department of Fish and Game and the Nevada Fish and Game Commission have recommended a flexible formula based on snow-survey forecasts which calls for a minimum release of 70 second-feet in forecasted normal years and proportionate decreases and increases in years of subnormal or above-normal forecasts. It is considered essential that a cooperative study be made to develop the best practicable formula for predicting the yield of Lake Tahoe and to devise criteria for scheduling of releases to streamflow in the Truckee River from the lake. Once such a formula and such criteria are determined, the cooperating agencies should negotiate an agreement among all interested agencies which will ensure that releases are actually made from the lake on the schedules resulting from the study. The agencies cooperating in the study should include the California Department of Fish and Game, the Nevada Fish and Game Commission, the Bureau of Reclamation, the Service, and probably the state water agencies."

The final instream flow release agreement for Tahoe Dam involved a fishery maintenance release from the proposed Prosser Creek Dam to augment flows of the Truckee River below the City of Truckee (see Figure 1). Subsequently the minimum

instream flow proposed by the Bureau of Reclamation of 50 cfs was approved by the state and local agencies involved. The 50 cfs minimum was included as a condition in the 1954 water rights application for the Washoe project.

Numerous water rights activities have occurred since 1954. Of great significance to instream flow is the Bistate Compact Commission (California-Nevada) and the lawsuit by Pyramid Lake Indians.

> "Final adjudication or apportionment of waters in the Tahoe, Truckee, Carson or Walker basins between California and Nevada, a situation which has led to many disagreements and threats of litigation between these states. For this reason, negotiations began in 1955 between the states and the federal government on an interstate compact which would avoid litigation by allocating the waters in a manner agreeable to all parties. After many years of negotiation, a proposed compact was adopted by the California State Legislation in 1970 and by the Nevada Legislature in 1971. A bill seeking ratification of the proposed compact is pending in Congress, but consent and approval has not yet been obtained. The proposed compact stabilizes and formalized the high and low levels of Lake Tahoe, provides for construction and operation of an overflow facility upstream from the existing outlet gates to stabilize the level of Lake Tahoe, and formalizes the annual diversions of water for use in the Lake Tahoe basin. The low level of the lake is fixed at 6,223.0 feet and the high level at 6,229.1 feet. The annual diversion for use within the Lake Tahoe basin from all natural sources and under all water rights in the basin is fixed at 34,000 acre-feet annually, with 23,000 acre-feet allocated by California and 11,000 acre-feet allocated to Nevada.
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> "The proposed California-Nevada Interstate Compact also contains major provisions allocating water of the Truckee River and its tributaries, including Lake Tahoe releases. As a matter of first priority the proposed compact allocates water to Nevada for use on the Pyramid Lake Indian Reservation, in the sum of 30,000 acre-feet per year as provided in the 1944 Truckee River Decree. The proposed compact also sets certain limits on the

Prosser Creek Reservoir, the Stampede Reservoir and recognizes certain rights of diversion from the Truckee River and certain rights of the Sierra Valley Water Company. All water in excess of that allocated to California is allocated to Nevada.

"It is noteworthy that the proposed Interstate Compact does not speak to the issue of maintaining the existing level of Pyramid Lake, which has of late become a major policy goal of the federal government. A discussion of recent judicial decisions and further litigation will bring the water rights question up to date.

"In October 1972 a decision relative to the claims of the Pyramid Lake Tribe of Paiute Indians was rendered in the U. S. District Court for the District of Columbia. This decision, referred to as the "Gessell Decision" for the judge who rendered it, was a court order for the Department of the Interior to assure a flow of 385,000 acre-feet per year at the Pyramid Lake terminus of the river. This is against average Truckee River flows of between 450,000 and 500,000 acre-feet per year at Derby Dam.

"The Department of the Interior reported back to the Court that it was unable to comply because the Truckee-Carson Irrigation District, which operates the Newlands Act diversion from the Truckee, had fully contracted the delivery of 235,000 acre-feet from the Truckee. The Court then ordered the Interior Department to modify its operational policy of allocation of Truckee River water to deliver the specified 385,000 acre-feet per year. The Interior Department developed a plan which in essence eliminates most Newlands Act Truckee River diversions, except in cases where Lake Lahontan has dropped to critically low levels.

"But the Truckee-Carson Irrigation District (T-CID) expressed its intent to continue its normal diversion levels, whereupon the Department of the Interior gave notice of termination of its contract with the District. Therefore, by the end of 1974, the Department of the Interior will have assumed operation of diversion from the Truckee. Litigation and appeals of both the Gessell Decision and the Interior Department termination of its contract with T-CID are still pending.

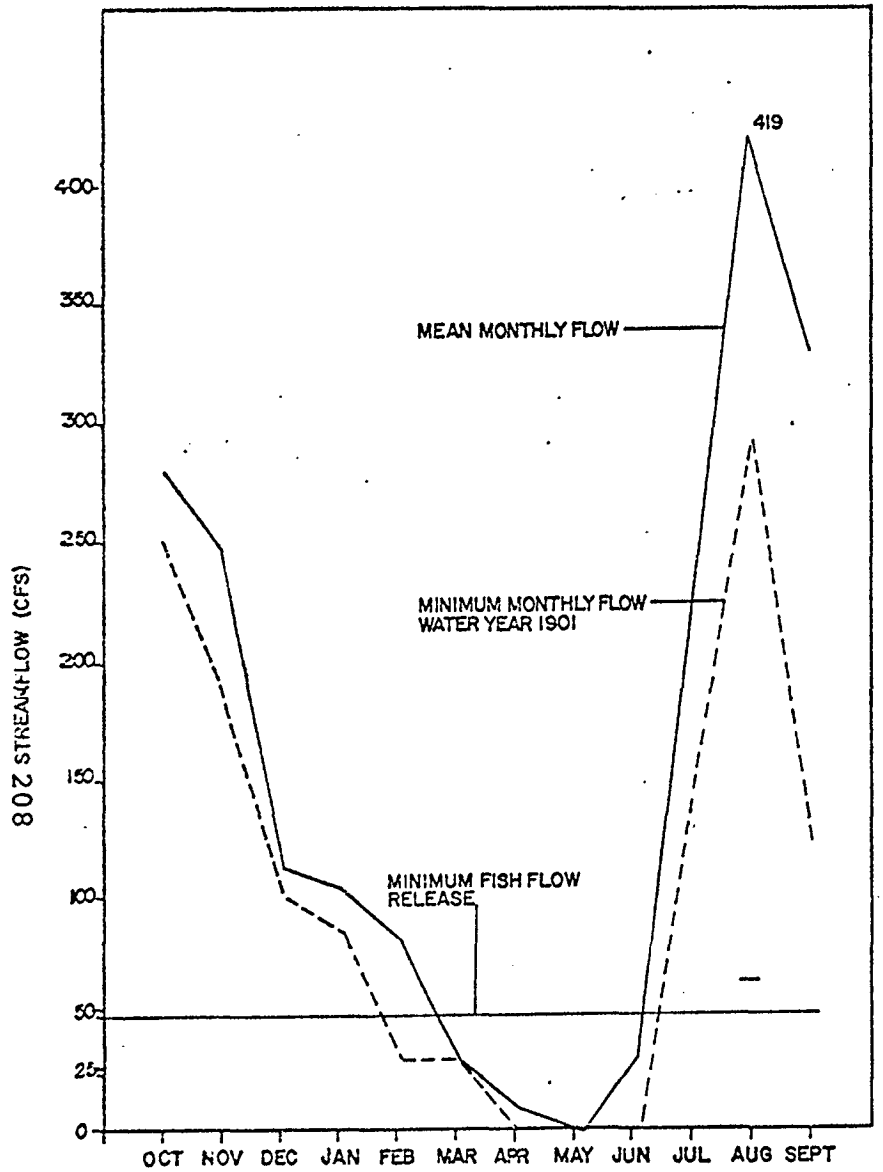
"In a parallel development, the Justice Department has undertaken legal action to establish the rights of the Pyramid Lake Paiute Indians to the waters of the Truckee River as 'aboriginal'. After failing to receive a hearing by the United States Supreme Court under its original jurisdiction, the Justice Department has filed suit in U. S. District Court in Reno, Nevada to establish the rights to the waters of the Truckee of the various contestants, with the rights of the Paiutes as aboriginal. This suit was filed on December 21, 1973 and promises to involve lengthy proceedings."

The eventual resolution of all water rights may alter instream flows for fish (Environmental Protection Agency, 1974).

IV. Post-Project

After the Bureau of Reclamation took over the operation of Tahoe Dam in the early 1900's, the instream flow release to the Truckee River changed considerably. A comparison of hydrographs (Figure 2) indicates a major difference in the release schedule. Minimum post-project flows do not go below 50 cfs; however, minimum historic flows were zero at the same location for as long as one month each year.

The Truckee River provided 66,410 angler days of fishing in 1956 with a total expenditure of $756,000 by the anglers for tackle, meals and lodging (California Department of Fish and Game, 1960). Later analysis of fishing pressure and economics was not available but one may assume that it has increased greatly since 1956. The majority of the fishing (approximately 80 percent) occurs in the upper portion of



PRE-PROJECT: 1901
GAUGE STATION NO.
SOURCE: U.S.G.S. WATER SUPPLY PAPER NO. 68

POST-PROJECT: OCTOBER 1964 – SEPTEMBER 1973
GAUGE STATION NO. 103375
SOURCE: SURFACE WATER RECORDS VOL. 2

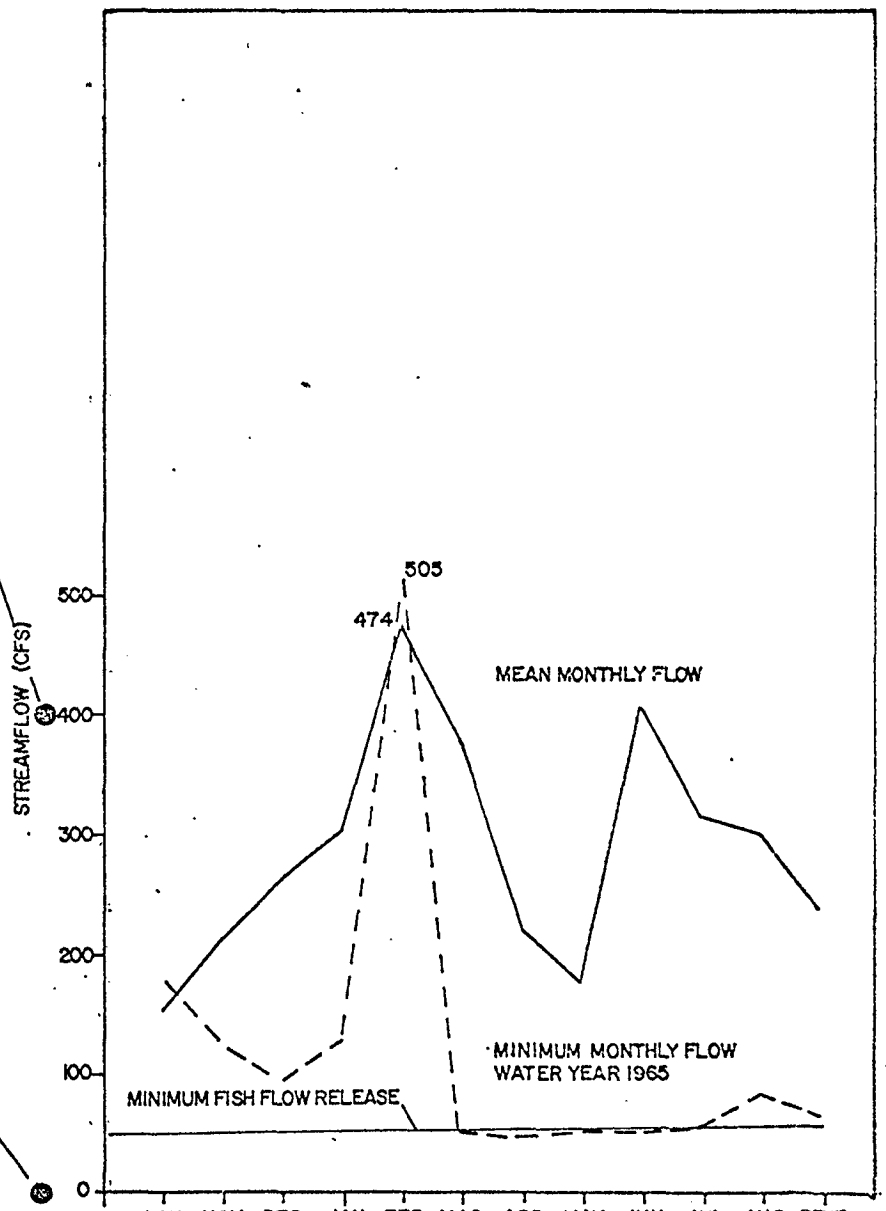


FIGURE 2
STREAMFLOW CONDITIONS, TRUCKEE RIVER BELOW LAKE TAHOE DAM

the Truckee River from Lake Tahoe to approximately Prosser Creek which is the reach affected by the minimum flow agreement. Stocking records show 15,000 catchable size rainbow trout and 20,000 catchable size eastern brook trout were planted in the Prosser Creek area in 1968 by the California Department of Fish and Game (Tahoe Regional Planning Agency, 1971). This section of the Truckee River is especially noted for dry fly trout fishing.

The Resources Agency in their report on The California Protected Waterways Plan (California Resources Agency, 1971), classified the waters of California with respect to their value as fisheries, wildlife, recreational and/or scenic waters. The Truckee River within California has been classified as a Class I (premium waterway) scenic, fishery, wildlife and recreation waterway.

Seventeen species of fish are found in Lake Tahoe and its surrounding streams and lakes. The mountain whitefish is the only remaining fish native to the Tahoe basin. There are several species of fish which are considered "game" fish. Table 1 includes all the species found within this area. Among these, the game fish are noted by an asterisk.

The brown trout was introduced at approximately the same time as the rainbow. The occurrences of these species in the fishery are common. The brook trout, also a rare occurrence

in the angler's catch, was first planted in Tahoe in 1888, and again in 1956. The brown trout and brook trout are both fall spawners utilizing the tributary streams.

The brown bullhead, golden shiner and mosquito fish have all been inadvertently introduced by man via bait buckets or for insect control. The brown bullhead and mosquito fish are generally restricted to the mouths of streams draining into the lake.

Nineteen species of fish are known to inhabit the Truckee River basin in Nevada, including Pyramid Lake. A listing of these species can be found in Table 1.

Water quality and channel conditions in the Truckee River change drastically as it flows out of the Sierra, through Reno and into Pyramid Lake. The water quality deteriorates because of both natural and social influences. Water temperatures increase, and flows are decreased to such an extent that Nevada Department of Fish and Game no longer considers the lower Truckee River (below Reno) a fishable water. Water leaving the Reno-Sparks area is diverted near Wadsworth at Derby Dam and is used for irrigation in the Newlands Reclamation project. As a result, water entering Pyramid Lake is greatly reduced with a rate of inflow being especially low during the summer months. Sedimentation and stream channel erosion have adversely altered the river downstream of Derby Dam.

Table 1

FISH DISTRIBUTION IN THE TRUCKEE RIVER AND LAKE TAHOE BASINS (INCLUDING PYRAMID LAKE)

Species	Upper Truckee River Basin	Lake Tahoe	Lower Truckee River Basin
Kokanee salmon*	x	x	
Mountain whitefish*	x	x	x
Golden trout*	x	x	
Lahontan cutthroat trout*	x	x	x
Kamloops rainbow trout	x	x	x
Brown trout*	x	x	x
Eastern brook trout*	x	x	x
Lake trout*		x	
Carp			x
Golden shiner	x	x	
Lahontan speckled dace	x	x	x
Lahontan redside		x	x
Fineraker tui-chub	x	x	x
Tahoe sucker	x	x	x
Cui-ui			x
Mountain sucker			x
Lahontan sucker	x	x	
Brown bullhead	x	x	x
Channel catfish			x
Mosquito fish	x	x	
Sacramento perch*			x
Green sunfish*			x
Large mouth bass*			x
Piute sculpin	x	x	x
Riffle sculpin			x

* Game species

Source: Draft Environmental Impact Assessment - Truckee-Tahoe Sanitation Agency, 1973.

The upper portion of the Truckee River, from the Nevada state line to Reno, is considered good trout fishing water. The principal species found in this section are rainbow trout, brown trout, brook trout, mountain whitefish and mountain sucker. The Nevada Department of Fish and Game planted 168,810 rainbow, brown and brook trout catchables in the upper Nevada portion of the Truckee River in the 1971-72 season. The majority of these fish were rainbow trout (Kern, pers. comm.). The lower Truckee River, below Reno, because of reduced flows and increased temperature, does not support a natural population of trout. Typical fish in this area are bullhead, largemouth bass, green sunfish, channel catfish, Tahoe sucker, carp, and Lahontan cutthroat trout. Lahontan cutthroat trout fingerlings (219,085) were planted in the lower Truckee River near Pyramid Lake in 1972 by the Nevada Department of Fish and Game with the hope that the majority of them would find their way into Pyramid Lake. The Truckee River in Nevada supported a total angling effort of 134,787 angler days in 1971 (Kern, pers. comm.).

Eight species of fish are found in Pyramid Lake; they include: cui-ui, Lahontan cutthroat trout, rainbow trout, tui-chub, Tahoe sucker, carp, Sacramento perch and the redside shiner. The Lahontan cutthroat trout, cui-ui, and the Sacramento perch are all considered rare and endangered species.

The cui-ui and the Lahontan cutthroat trout are native to the Pyramid Lake-Truckee River area and at one time were quite abundant. Both species historically spawned in the lower section of the Truckee River, but habitat destruction and introduction of exotic species (e.g., carp, golden shiner, bullhead) has reduced reproduction drastically. In an attempt to reestablish the Lahontan cutthroat trout to its previous population levels in Pyramid Lake, the Nevada Department of Fish and Game and the Bureau of Sport Fisheries and Wildlife are currently employing a heavy stocking program. In the 1966-1967 season, the total number of Lahontan cutthroat stocked in Pyramid Lake reached approximately 200,000 fish. In 1972, the Bureau of Sport Fisheries and Wildlife planted an estimated 500,000 fingerling Lahontan cutthroat trout. The goal in 5 years for the bureau is to reach an annual stocking rate of 2 million Lahontan cutthroat trout (King, pers. comm.). Pyramid Lake in 1972 supported a fishery totaling 105,000 angler days, the estimated maximum use under present conditions being 150,000 angler days per year. The fishery in the lake is an important economic asset to the Indian community.

Electroshocking sampling conducted in 1970 and 1974 revealed that the Truckee River from Tahoe to Nevada line supports an outstanding population of wild rainbow and brown trout many of which are trophy size. The river is currently being considered for wild trout management below the City of Truckee (Gerstung, pers. comm.).

V. Conclusion

Records of instream flows prior to the construction of Tahoe Dam were not available and may not have been recorded. The earliest recorded instream flows found in this investigation were compiled in 1901 approximately 30 years after the completion of the Tahoe Dam.

Tahoe Dam changed ownership and was modified several times. In 1908 the Truckee River General Electric Company purchased all the power plants along the Truckee River as well as the flow regulating Lake Tahoe Dam. The terms of the purchase included an agreement by the power company to maintain an average flow at Floriston, near the California-Nevada border, of 500 cfs between March 1 and September 30 and 400 cfs during the remaining months of the year. At the time, these flows were designed to assure sufficient water for power generation in California and for municipal and irrigational uses in Nevada. No consideration was given for fish and wildlife. As hydroelectric power development on the Truckee River intensified, licensing and permitting actions of the Washoe project allowed the Department of Fish and Game to establish a minimum instream flow reservation of 40 cfs from Tahoe Dam. Instream flows from 1964 through 1973 have been well above 50 cfs and rarely go below 100 cfs (see Figure 2).

The California-Nevada Bi-State Commission, U. S. Fish and Wildlife Service and the California Department of Fish and

Game studied Washoe project plans and evaluated the manner with which each facet of the project would affect fish and wildlife in the region.

Each agency subsequently issued their recommendations to the U. S. Bureau of Reclamation. Eventually the bureau evaluated each recommendation and proposed a 50 cfs instream flow reservation for the Truckee River downstream of Lake Tahoe. This reservation was approved by state and local agencies.

Development of the Truckee River led to the loss of a major Lahontan cutthroat trout population and fishery. This situation was not entirely the result of the reduction of flows or the blockage of fish passage into Lake Tahoe. Water quality and physical habitat changes between Reno and Pyramid Lake have had a major effect.

The Truckee River below Lake Tahoe presently supports an outstanding population of wild rainbow and brown trout (Gerstung, pers. comm.). However, the maintenance of this fishery by the minimum flow reservation has not been tested because flows have been considerably higher than the minimum of 50 cfs.

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